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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/622,351	07/18/2003	Joon Hyeon Lee	CU-3305 RJS	4792

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EXAMINER	
ISAAC, STANETTA D	

ART UNIT	PAPER NUMBER
2812	

DATE MAILED: 12/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/622,351	LEE, JOON HYEON	
	Examiner	Art Unit	
	Stanetta D. Isaac	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 11-17* is/are rejected.

7)☒ Claim(s) *8-10* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: On page 11 line 3 of DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS. The trench 240 should be trench 220. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1, 2, 4, 6, 7, and 11, 13-17 are a rejected under 35 U.S.C. 102(a) as being anticipated by Lin et al. US Patent 6,001,707.

4. Lin teaches the semiconductor method substantially as claimed. See **FIGS. 1A-2F** where Lin teaches a method for forming an isolation film for semiconductor devices, which comprises the steps of:

successively forming a first oxide film **202** and nitride film **204** on a semiconductor substrate;

patterning the nitride film and the first oxide film to expose a portion of the semiconductor substrate, which corresponds to an isolation region;

implanting impurity ions **214** into the exposed portion of the semiconductor substrate to form an impurity ion-implanted layer **212**;

forming a spacer at the sidewall **216** of the patterned nitride film, and at the same time, etching the ion-implanted layer using the spacer as a mask;

etching a portion of the semiconductor substrate exposed by the etching if the ion-implanted layer, using the spacer as a mask, thereby forming a trench **218**;

removing the spacer;

annealing the trench so that the corner of the trench is rounded **220a**;

forming a second oxide film **224** along the inner wall of the trench;

depositing a polarizing oxide film **226** on the entire surface of the resulting substrate in such a manner as to gap fill the trench;

subjecting the polarizing oxide film to chemical mechanical polishing (CMP) using the nitride film as a polishing stopper film, thereby polarizing the polarizing oxide film; and

removing the nitride and first nitride films remaining after the polarizing step.

5. Pertaining to claim 2, Lin teaches the method of claim 1, wherein the step of patterning the nitride film and the first oxide film is carried out by dry-etching with an activated plasma consisting of a gas mixture of CHF_3, CF_4, Ar and O_2.

6. Pertaining to claim 3, Lin teaches the method of claim 1, wherein the step of patterning the nitride film and the first oxide film is carried out by dry-etching with an activated plasma consisting of a gas mixture of CHF_3, CF_4, Ar, O_2 and C_xF_y.

7. Pertaining to claim 4, Lin teaches the method of claim 1, wherein the impurity ions are phosphorus or boron ions.

8. Pertaining to claim 6, Lin teaches the method of claim 1, wherein the etching of the ion-implanted layer provides an ion-implanted residual layer, which is formed by a multi-step dry etching process using the spacer as a mask.

9. Pertaining to claim 7, Lin teaches the method of claim 6, wherein the surface if the ion-implanted residual layer is rounded.

10. Pertaining to claim 11, Lin teaches the method of claim 1, wherein the step of etching the ion-implanted layer is carried out by dry etching with an activated plasma consisting of a gas mixture of CHF_3, CF_4, Ar and O_2.

11. Pertaining to claim 13, Lin teaches the method of claim wherein the step of forming the trench is carried out by dry-etching the substrate with an activated plasma consisting of a gas mixture of HBr, Cl_2, O_2, and H_2.

12. Pertaining to claim 14, Lin teaches the method of claim 1, wherein the step of removing the spacer is carried out with a cleaning solution containing HF or H_2SO_4.

13. Pertaining to claim 15, Lin teaches the method of claim 1, wherein the second oxide film is a sacrificial oxide film acting to compensate for the damage of the trench inner wall.

14. Pertaining to claim 16, Lin teaches the method of claim 1, wherein the remaining nitride film is removed by phosphoric acid dipping.

15. Pertaining to claim 17, Lin teaches the method of claim 1, wherein the isolation film is formed along the rounded corner of the trench.

16. Pertaining to claims 2, 3, 11 and 13, see Lim et al. US Patent 6,228,727 lines 16-35 with regards to inherency regarding conventional dry-etching process used to create trenches where it includes dry-etching chemistry.

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

18. Claims 3, 5, 8-10, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. US Patent 6,001,707 in view of conventional prior art.

19. Pertaining to claim 5, Lin fails the method of claim 1, wherein the spacer is made of polymer. See **col. 4 lines 50-53**, where Lin teaches that a spacer made of silicon oxide material is removed by using hydrofluoric acid solution. In view of Lin it would have been obvious to one of ordinary skill in the art to substitute a polymer for the spacer because it would prove to be equivalent because both materials are removed by a hydrofluoric acid solution.

20. Pertaining to claim 12, Lin fails the method of claim 1, wherein the step of etching the ion-implanted layer is carried out by dry etching with an activated plasma consisting of a gas mixture of CHF_3, CF_4, Ar, C_xF_y, N_2, and H_2. **See col. 4 lines 20-24**, where Lin teaches in general an anisotrophic etching method is used to remove the exposed pad oxide and substrate material through the opening however, a reactive ion etching (RIE) method is preferred. In view of Lin it would have been obvious to one of ordinary to incorporate the dry-etching activation plasma mixture because ultimately a trench is formed in the substrate.

Allowable Subject Matter

21. Claims 8-10 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

22. The following is a statement of reasons for the indication of allowable subject matter: The dependent claims 8-10 indicate allowable subject matter because none of the references of record teach or render obvious method wherein a multi-step dry etching process is carried out using a gas containing fluorine of a given amount as a main component, the flow rate of fluorine is gradually increased as the multi-step dry etching process is progressed, or the flow rate of the fluorine is gradually reduced as the multi-step dry etching process is progressed.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stanetta D. Isaac whose telephone number is 703-308-5871. The examiner can normally be reached on Monday-Friday 7:30am -5:30pm.

24. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 703-308-3325. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

25. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Stanetta Isaac
Patent Examiner
December 17, 2003

John F. Niebling
Supervisory Patent Examiner
Technology Center 2800